APPARATUS FOR STABILIZING A LADDER DURING USE AND STEPLADDER INCORPORATING THE SAME

Field of the Invention

[0001] The present invention relates generally to the field of ladders, and specifically to apparatus for increasing the stability of ladders and improved stepladders incorporating the same.

Background of the Invention

[0002] Although ladders are not rated high on the Consumer Product Safety Commission list of hazardous products, use of ladders has always entailed the danger of falling off of the ladders due to the side-ways tipping of the ladder. This is because the combination of a ladder and an individual standing on the ladder has a high center of gravity relative to the width of the ladder base. With stepladders, a prominent hazard is lack of lateral stability so that when a climber on the ladder reaches outward to perform a task or push laterally, the ladder may not resist both static and dynamic loading or shifting weight thereby resulting in a tilting accident. Thus, there is a need to improve upon their construction to diminish these hazards to users.

[0003] It has been established that a primary element in stepladder stability is the total width of the ladder base. Another factor is the climbing height for any particular ladder size. Hence, stepladder stability can be improved by increasing the width of the base of a ladder, as opposed to adding to the length of its steps.

[0004] The prior art is replete with attempts to maximize the stability of ladders. One such attempt involves the appending to a ladder of adjustable outrigger arms to provide the ladder with an effectively wider base. Examples of attempts can be found in U.S. Pat. Nos. 2,997,127, 3,878,917, 4,011,926, 4,175,641, 4,433,754, 4,519,477, 4,625,832, 4,641,729, 4,872,529, and 5,086,876. The problem with these prior art attempts is that they provide devices which tend to be cumbersome, limited, awkward, complex, and difficult and/or time consuming to manufacture. Moreover, prior art devices only increase the base of the ladder in a single direction, such as width (i.e. side to side), and do not provide added stability in the forward or backward directions. There is therefore a need for a ladder stabilizing apparatus that is light, non-cumbersome, simple in construction, versatile, quick and easy to

manufacture and attach to a ladder, and provides added stability in more than one linear direction.

Summary of the Invention

[0005] The present invention satisfies these and other needs. In one aspect, the invention is an apparatus for stabilizing a ladder on a ground surface comprising: a first plate adapted to be secured to a leg of the ladder; a second plate having a top surface and a bottom surface, the second plate pivotally connected to the first plate and pivotal between a retracted position where the second plate does not substantially contact the ground surface and a stabilizing position where the bottom surface of the second plate is in contact with the ground surface; a member having a proximal end pivotally connected to the first plate and a distal end, the member pivotal between a substantially upright position and a support position where the distal end of the member is in contact with the top of the surface of the second plate when the second plate is in the stabilizing position.

[0006] When the second plate is in the stabilizing position and the member is in the support position, the base of the ladder to which the apparatus is attached is effectively increased in size. The second plate can be sized so that when it is in the stabilizing position, both the width and length of the perimeter of the ladder base is increased. By not connecting the distal end of the member to the second plate, both the member and the second plate can be moved to a retractable position for easy storage. Ease of use and storage is also increased by the member being preferably designed to be less than 12 inches in length. However, stability is not compromised by having a short member for support because the increase in the size of the base dictated by the size of the second plate, not the length of the member as with prior art devices.

[0007] In order to ensure that the distal end does not slide with respect to the top surface of the second plate, the distal end of the member preferably has a rubber stop provided at its end for contacting the top surface of the second plate when the member is in the support position and the second plate is in the stabilizing position. Optionally, any means to prohibit sliding can be used, such as a groove or ridge formed into or on the second plate.

[0008] The first plate preferably comprises mounting brackets extending outward from the first plate for pivotally connecting the proximal end of the member. The first plate can be rigidly secured to the leg of the ladder by a plurality of bolts or other fasteners. The member pivots between the substantially upright position and the support position about a first axis.

The second plate pivots between the retracted position and the stabilizing position about a second axis. It is further preferable that these first and second axes be substantially parallel.

[0009] When the apparatus is properly secured to the leg of the ladder and the second plate is in the stabilizing position, the second plate will preferably be substantially horizontal and flush with a bottom surface of the leg of the ladder.

[0010] In another aspect, the invention is a stepladder incorporating the above apparatus on at least one of its legs. More specifically, in this aspect, the invention is a stepladder having high stability comprising: a plurality of legs in contact with a ground surface; and a stabilizing assembly having a first plate secured to an outer surface of at least one of the legs, a second plate having a top surface and a bottom surface, the second plate pivotally connected to the first plate and pivotal between a retracted position where the second plate does not substantially contact the ground surface and a stabilizing position where the bottom surface of the second plate is in contact with the ground surface; a member having a proximal end pivotally connected to the first plate and a distal end, the member pivotal between a substantially upright position and a support position where the distal end of the member is in contact with the top of the surface of the second plate when the second plate is in the stabilizing position. In this embodiment, it is preferable that each of the two rear legs of the stepladder have a stabilizing assembly secured thereto.

[0011] In yet another aspect, the invention is a second embodiment of a stepladder having high stability. In this embodiment, a first plate is not used to connect the base plate and member to the leg of the stepladder. Instead, the member and a base plate (i.e., the second plate), is pivotally connected directly to a leg of the ladder. In this aspect, the invention is a stepladder comprising a plurality of legs in contact with a ground surface; and a stabilizing assembly secured to an outer surface of at least one of the legs, the stabilizing assembly comprising a base plate having a top surface and a bottom surface, the base plate pivotally connected to the outer surface of the leg and pivotal between a retracted position where the base plate does not substantially contact the ground surface and a stabilizing position where the bottom surface of the base plate is in contact with the ground surface; a member having a proximal end pivotally connected to the outer surface of the leg at a position higher than the base plate and a distal end, the member pivotal between a substantially upright position and a support position where the distal end of the member is in contact with the top of the surface of the base plate when the base plate is in the stabilizing position.

Brief Description of the Drawings

[0012] FIG. 1 is a perspective view of stepladder according to one embodiment of the present invention.

[0013] FIG. 2 is a perspective view of a ladder stabilizer according to an embodiment of the present invention.

[0014] FIG. 3 is a front view of the ladder stabilizer of FIG. 2.

[0015] FIG. 4 is a side view of the ladder stabilizer of FIG. 2 with the base plate in a retracted position and the pole member in a substantially upright position.

[0016] FIG. 5 is a side view of the ladder stabilizer of FIG. 2 with the base plate in a stabilizing position and the pole member in the substantially upright position.

[0017] FIG. 6 is a side view of the ladder stabilizer of FIG. 2 with the base plate in the stabilizing position and the pole member in the support position.

[0018] FIG. 7 is a close-up side view of a bottom portion of a rear leg of the stepladder of FIG. 1, wherein the base plate of the ladder stabilizer is in the retracted position and the pole member of the ladder stabilizer is in the substantially upright position.

[0019] FIG. 8 is a close-up side view of a portion of the rear leg of the stepladder of FIG. 1, wherein the base plate of the ladder stabilizer is in the stabilizing position and the pole member of the ladder stabilizer is in the support position.

[0020] FIG. 9 is a side view of a bottom portion of a leg of a stepladder according to a second embodiment of the present invention.

[0021] FIG. 10 is a schematic of how the size of the base of a stepladder is increased using an embodiment of the ladder stabilizer according to the present invention.

Modes for Carrying Out The Invention

[0022] FIG. 1 illustrates stepladder **10** according to a first embodiment of the present invention. Stepladder **10** has two front legs **11** and two rear legs **12**. Steps **13** are provided between front legs **11** for a user to climb. Brace **17** is provided between rear legs **17** for structural integrity. Stepladder **10** further comprises ladder stabilizers **20** secured at the bottom portion **14** of each of the rear legs **12**.

[0023] Referring now to FIG. 2, ladder stabilizer **20** is illustrated removed from bottom portion **14** of rear leg **12**. Ladder stabilizer **20** comprises base plate **21**, connection plate **22**, and pole member **23**. Base plate **24** has top surface **24** and bottom surface **25**. Pole member **23** has a distal end **26** and a proximal end **27**. Proximal end **27** of pole member **23** is

pivotally connected to connection plate **22** so as to be rotatable about axis **B-B**. Base plate **24** is pivotally connected to connection plate **22** so as to be rotatable about axis **A-A**. Axis **A-A** and axis **B-B** are substantially parallel to one another. Pole member **23** is pivotally connected to connection plate **22** at a higher position on connection plate **22** than is base plate **21**.

[0024] Turning now to FIGS. 4-6, pole member **23** is pivotally connected to connection plate **23** so as to be capable of rotating about axis **B-B** between a substantially upright position (as illustrated in FIG. 4) and a support position (as illustrated in FIG. 6). Base plate **21** is pivotally connected to connection plate **22** so as to be capable of rotating about axis **A-A** between a retracted position (illustrated in FIG. 4) and a stabilization position (which is illustrated in FIG. 5). The fully upright position of pole member **23** and the retracted position of base plate **22** are storage positions in which pole member **23** and base plate **21** are close to rear leg **12** of the stepladder **10** (FIG. 8). When base plate **22** is in the in the stabilization position and pole member **23** is in the support position, stop **38**, which is part of distal end **26** of pole member **23**, contacts upper surface **24** of base plate **21** (FIG. 6).

[0025] Referring now to FIGS. 2 and 3, the pivotal connection of pole member **23** to connection plate **22** is accomplished through the use of mounting brackets **29** which extend outwardly from surface **33** of connection plate **22**. Pole member **23** is pivotally connected to mounting brackets **29** with pin **28** (FIG. 3). Mounting brackets **27** are a part of a mounting bracket assembly **34** which is secured to connection plate **22** via bolts **35** which engage nuts **36** (FIG. 4). Alternatively, mounting plates can be formed directly from or welded directly to the connection plate. While a mounting bracket assembly is disclosed as the means for pivotally connecting the member to the connection plate, any means for pivotally connecting two structures can be used to form the pivotal connection.

[0026] Proximal end **27** of pole member **23** is not symmetrically shaped. Proximal end **27** is shaped so that an extruding portion of the proximal end **27** contacts flexible plate **37** as pole member **27** is rotated about axis **B-B** from the support position toward the substantially upright position. When pole member **27** is fully rotated to the substantially upright position, the extruding portion of the proximal end **27** slips free of contact with flexible plate **37**. Flexible plate **37** acts as a locking mechanism for keeping pole member **27** in the substantially upright position until the user applies counter rotational force to pole member **23** to rotate pole member **23** about axis **B-B** back to the support position.

[0027] Distal end **26** has a stop **38** connected thereto. Stop **38** is made of rubber and connected to distal end **26** so that it contacts top surface **24** of base plate **21** when pole member **23** is in the support position and base plate **21** is in the stabilizing position. Stop **38** is made of rubber so that pole member **23** does not easily slide with respect to top surface **24** of base plate **21** when it is in contact therewith. Alternatively, this sliding can be restricted by forming a groove into or a ridge extending out of base plate **22** that distal end **26** contacts, preventing horizontal movement.

[0028] The pivotal connection of base plate **21** to connection plate **22** is accomplished by extending pin **30** through cylindrical portions **31** of base plate **21** and the cylindrical portion **32** of connection plate **22**. This pivotal connection is the same as is used in standard door hinges. Pin **30** is sized so that a tight fit is formed so that base plate **21** can be rotated about axis **A-A** and hold any position of rotation upon rotational force being removed. Pin **30** is sized so that base plate **21** will not rotate by the affect of gravity or merely moving stepladder **10** during normal use.

[0029] Both base plate **21** and connection plate **22** have a plurality of holes **40** spaced throughout. Holes **40** on connection plate **22** are used to secure ladder stabilizer **20** rear leg **12** of stepladder **10** by extending bolts (not illustrated) therethrough and threadily engaging corresponding holes in the rear leg **12**. However, connection plate **22** can be connected to rear leg **12** any means known in the art, including for example welding, clamping, or forming a sleeve-type fit.

[0030] Referring now to FIG. 7, each ladder stabilizer **20** is connected to a bottom portion **14** of rear leg **12** of stepladder **10**. Ladder stabilizer **20** is connect to bottom portion **14** of rear leg **12** so that when base plate **21** is in the stabilizing position, bottom surface **25** of base plate **21** is substantially flush with a bottom surface **16** of leg **12**. As such, bottom surface **25** of base plate **21** is in substantial contact with the ground surface **50** upon which leg **12** is resting. When leg **12** is in a flat ground surface, base plate **21** will be substantially horizontal when in the stabilizing position. Base plate **21**, when in the stabilizing position and held in place by pole member **23**, increases the size of the base of the stepladder to which it is secured.

[0031] Referring to FIG. 10, base plate **21** can be sized to so that when it is in the stabilizing position and contacting the ground surface **50**, the perimeter **P** (illustrated in dashed lines)of the base formed by the legs **12** and **11** (FIG. 1) is increased in both width (side to side) and

length (back to front). As illustrated, the width is increased from **W** to **W'** and the length is increased from **L** to **L'**.

[0032] Referring now to FIG. 8, when base plate **21** is moved to retracted position, bottom surface **25** of base plate **21** is not in contact with ground surface **50**. The invention is not limited to having ladder stabilizer **20** secured to any set amount of legs of the stepladder, or any specific arrangement. For example, a ladder stabilizer **20** can be secured to all four of the legs or only one.

[0033] Referring now to FIG. 9., in another embodiment, the invention can be practiced without the use of a connection plate **22**. In this embodiment, ladder stabilizer **60** does not have a connection plate and base plate **21** and pole member **23** are pivotally connected directly to the leg **12** of the stepladder. Pole member **23** is pivotally connected to leg **12** with the mounting bracket assembly **34** discussed above. Base plate **21** is pivotally connected to leg **12** with a similar mounting bracket assembly **62**.

[0034] Various alternatives, alterations, and modifications should be readily apparent to those skilled in the art without departing from the spirit and scope of the invention. The above embodiments of the acoustical stack can be used for a variety of substrate processing steps, including but not limited to cleaning and stripping.